Los Alamos
Inertial Confinement Fusion

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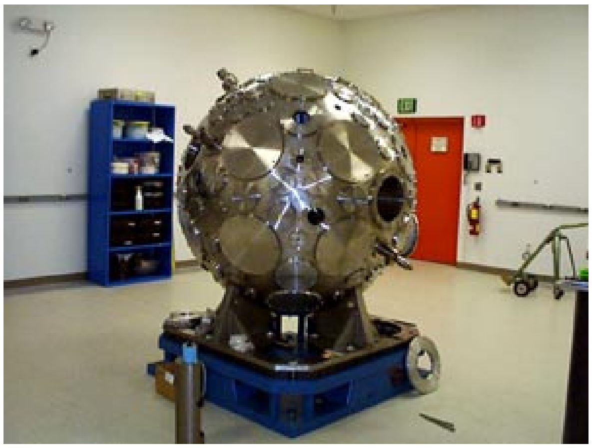
Trident:
Second Target Chamber for Trident

The Trident laser facility at LANL has recently been upgraded by the installation of a new target chamber in the recently completed High Energy Density Experimental Laboratory (HEDXL) target bay. This target chamber, which was recently acquired from the Laboratory for Laser Energetics (LLE) at the University of Rochester, was the original target chamber installed in the Omega laser facility at UR/LLE in the early 1980's. The target chamber was removed when Omega was upgraded in the early 1990's and had been in storage at LLE since. Along with the target chamber, LANL acquired a large number of optics, optical mounts, frequency tripling crystals, laser and experimental diagnostics, target positioners and viewing systems - all of which had been used on the original Omega system. Two truckloads of equipment, weighing almost 80,000 pounds, were transferred from Rochester to Los Alamos. The target chamber, vacuum system, focusing optics, viewing systems and target positioner were installed in the HEDXL bay.



Plans for an upgrade to the Trident laser are underway. These plans include incorporating this chamber into the upgraded facility. With 28 beam ports, this would be a very flexible chamber which could be used for both direct and indirect drive illumination.

Target Physics:
Laser-Plasma Interactions in a Single Hot Spot

We have performed the first round of experiments on Trident to study laser-plasma interactions in a single hot spot. A single hot spot is generated using a 527 nm diffraction limited laser as the interaction beam, which is focused using an f/7 lens to intensities of 10^{14} - 10^{16} W/cm^2. The hot spot beam mimics a single speckle within a more complex laser beam, such as from a random phase plate (RPP) smoothed beam, and is the smallest fundamental interaction volume. Measurements of stimulated Raman scattering (SRS), stimulated Brillouin scattering (SBS), beam steering, and self-focusing from this hot spot interaction can be used to benchmark our state-of-the-art numerical models of laser-plasma instabilities. Initial experimental results from the single hot spot interaction show evidence of beam steering in plasmas with large transverse flow using the transmitted beam images, and anti-correlation between backscattered SRS and SBS. There may be further evidence of a coupling between filamentation and SRS in these experiments. Gated imaging spectra of Thomson scattered signals from electron plasma waves and from ion acoustic waves (shown in the figure) are used to measure spatial profiles of electron density, electron temperature, ion temperature, and flow velocity in a long-scalelength plasma created in these Trident experiments.